Preparing Young Women

FOR WORK AND CITIZENSHIP IN A TECHNOLOGICAL SOCIETY

Wisconsin Department of Public Instruction

STATE OF WISCONSIN DEPARTMENT OF PUBLIC INSTRUCTION

John T. Benson,
State Superintendent

125 S. Webster St.
P.O. Box 7841
Madison, WI
53707-7841

1-800-441-4563
1-608-266-3390

Wisconsin women in TECHNOLOGY

Through technology, people have changed the world. They have developed and improved ways to communicate, travel, build structures, make products, cure disease, and provide food. The 21st century will introduce new technologies that are sure to be more complex, mature, and versatile than those we use today.

One of the primary ways we can prepare the next generation to work and live in an increasingly technological society is through technology education. In technology education, students learn to design, develop, and use technological systems through open-ended, problem-based design activities. Using up-to-date resources, students apply technological knowledge and processes to real-world experiences. And, finally, students learn to set goals, make decisions, and solve problems in a variety of situations: as individuals, as members of small groups, and as part of large teams.

Elizabeth Burmaster
State Superintendent

Technology education is also important because it affects other academic disciplines. Technology has a cyclical relationship with science and mathematics. The science community seeks to understand nature, and technology seeks to design a human solution, which opens up new areas of scientific research. Mathematics is a vital tool that is used universally by both science and technology.

Right now, we are doing a better job of preparing young men than young women to learn, work, and live in an increasingly technological society. In Wisconsin, of the more than 21,000 11th- and 12th-graders participating in technology education, less than 18 percent are young women. While we have seen a steady increase in the percentage of young women enrolled in technology education courses, we still have a long way to go. (See Figure 1)

It appears many young women do not view technology education as a critical component to their high school educations (See Figure 2), a perception we need to change. The *TACKLE Box Project (Technology Action Coalition to Kindle Lifelong Equity)*, a statewide initiative that is a component of the statewide reform movement in technology education (in alignment with *Wisconsin's Model Academic Standards for Technology Education*), provides training and information to increase the number of girls and young women in technology education.

For girls, young women, and women to exercise their right to make free and informed choices about their work and citizenship, our technology education programs must equitably meet their needs as well as those of young men. There still are occupations in which women barely have a presence. Women are 9 percent of all engineers and aviation maintenance technicians, 6 percent of all mechanical engineers, and 4 percent of all aerospace engineers and computer scientists. Only one in 100 electrical power installers and repairers, excavation and loading machine operators, and masons and carpenters are women. One in 50 electricians, plumbers, concrete finishers, and crane operators are women.

Technical education programs and training for the skilled trades can mean the difference between making a real living and just getting by. Compare the national median income of a chemical engineer ($64,000) with that of a preschool teacher ($17,310), or that of a telephone line installer ($20.48 per hour) with that of a child care worker ($6.61 per hour). When young women are not involved in training programs in non-traditional occupations, they miss out on real opportunities to make a living wage.

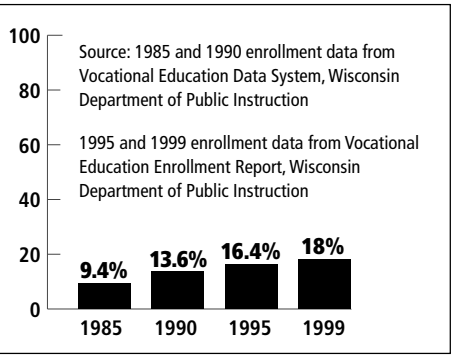
Our state is facing a labor crisis. We must prepare young men and women of all ethnicities and abilities to work with technology because we need them in the workforce and because they may love the work. The opportunities are there: in Wisconsin, 80 percent of new jobs require technical training; 20 of the 30 fastest growing occupations in the U.S. require technical education; and 40 percent of the skilled trade workers in Wisconsin will reach retirement age within the next five years.

Research tells us why young women are not participating in technology education. The *TACKLE Box Project* will provide strategies to encourage young women to participate in technology education. Now, all we need is the commitment. It will take all of us—the Department of Public Instruction, administrators, educators, counselors, school-to-work coordinators, parents, business and community members and organizations, postsecondary institutions, and students—to make a difference. Please join me in this effort.

Figure 1

Young women's participation in technology education: 1985-1999

Percent of Total Enrollment in High School Technology Education Programs



Wisconsin's labor force participation rate of 69.6% for females is the highest in the United States. The national average is 50.3%. *Workforce Reality in Wisconsin Today, DWD.*

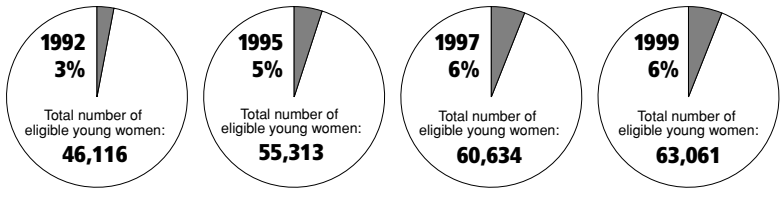
Within six months of graduation, 94% of Wisconsin technical college graduates are employed and 81% of those find jobs in the field they've chosen. *Wisconsin Technical College System.*

Employment of technicians and related support occupations is projected to grow by 22% between 1998 and 2008. Over half of this projected employment growth among technicians—about 616,000 jobs—is among health technicians and technologists. Considerable growth is also expected among computer programmers and paralegal and legal assistants. *US Bureau of Labor Statistics.*

Figure 2

11th-12th grade young women eligible for and participating in technology education

Source: Vocational Education Enrollment Reporting System, Wisconsin Department of Public Instruction



factors

Why aren't more girls participating in technology education? Researchers and educators have identified five factors that strongly influence

1 SOCIAL FIT

"Social fit" refers to how the messages of society, culture, community, parents, and peers influence girls and young women in their education and career decision-making process. We know the more messages girls receive from different groups of people that "girls don't belong in technology education or nontraditional occupations," the more likely it is that girls won't *participate* in technology education.

Society—through toys, movies, books, videos, games, and advertising—rarely portrays girls, young women, or women involved in technology-based activities, trades, or careers. Instead, much of the focus of games and products targeted toward girls and young women is on physical appearance, relationships, and domestic endeavors.

Cultures—whether based on community, race/ethnicity, socioeconomic status, religion, or other factors—often send messages that women (or men) don't belong in nontraditional occupations for a variety of reasons that are specific to the culture. For example, some religious denominations tell women that their role is to stay at home with the children. Other examples include, "girls at this school don't enroll in technology education," "African-American women pursuing postsecondary education should attend and receive a degree from a liberal arts college," "middle-class women should be white-collar professionals," and "women in *this* community don't take [nontraditional] jobs from men." When developing recruitment and retention programs for young women, it is important to take into consideration specific cultural messages diverse young women may be receiving.

Parents and other family members, both consciously and unconsciously, send multiple messages to girls about participation in technology education and work in nontraditional occupations. These messages begin and are learned when children are young. Adults often pass along messages they learned through society, their particular cultures, and their families. One well-intended but limiting message that parents communicate often to boys *and* girls is that students preparing for college should not participate in technology education.

In middle and high school, peers are one of the primary communicators about what is and is not appropriate for boys and girls. Additionally, most young men and women receive messages of self-worth and acceptance from their peers. When peers communicate to a girl that technology education and nontraditional occupations are for boys and men, it is the remarkable and atypical girl who will resist that message and participate in technology education and nontraditional work-related programs without supportive interventions by school staff and community members.

Strategies to consider

- Encourage gender parity in the placement of students in businesses and organizations.
- Sponsor multi-week afterschool programs for families to explore technology together through fun and constructivist activities.
- Recruit girls to participate in technology education *as a group*, not as individuals.
- Include female and minority business, industry and labor representatives and advocacy groups for girls and women on school advisory committees.
- Encourage early grade hands-on, risk-taking activities, including sports.
- Value and support math and science achievement.
- Send home fliers that discuss technology, technology education, and nontraditional occupations with children in elementary grades.
- Post fliers about technology, technology education, and nontraditional occupations on community bulletin boards and at laundromats, stores, hospitals, churches, food banks, drug stores, employment centers, shelters, schools, etc.
- Post signs about technology, technology education, and nontraditional occupations on buses and at baseball/soccer/football games.
- Link with social services and community-based organizations as well as other educational facilities.
- Host open house orientation programs that provide childcare.
- Present to elementary school parent groups on technology education.
- Involve diverse parents in evaluating projects.

2 CLASSROOM CLIMATE

The "classroom climate" is a combination of all that occurs in and all that is communicated and taught in the classroom: physical space, teacher-to-student interactions (verbal and nonverbal), and student-to-student interactions (verbal and nonverbal).

Females tend to avoid technology education classrooms and related careers because they are intimidated by the traditional dirty, rough, and stressful learning environments or by the physical strength that is (or perceived to be) required to operate some equipment. Although technological careers as well as some technology education classrooms have become much more "sterile" environments, the stereotype of the "dirty shop" remains in the minds of many girls and young women and those who influence them.

Once in the classroom, girls may get specific or hidden messages from teachers that they do not belong in technology education (referring to girls by their first names while using "Mr. ___" when talking to the boys; responding to the students who are most vocal and most aggressive, which, research shows, is often the boys in the classroom; doing an activity for a girl in contrast to explaining the steps to a boy and encouraging him to do it independently; etc.).

Boys also may communicate to girls that they don't belong in technology education. Since boys have been the majority of students enrolled in the technology education classroom, female students tend to be uncomfortable and perceive themselves as being on display. Some classrooms are intensely competitive, and many boys see the female students as either intruders or romantic targets. The notion of a "boys club" has attached itself to technology education and the jobs related to it, and girls may appear as intruders when they choose to enroll in these classes.

Strategies to consider

- Ensure that the workspace is appropriately neat and clean.
- Provide appropriate protective gear in a variety of sizes for both cleanliness and safety.
- Establish rules at the beginning of the semester for respectful classroom interactions and procedures.
- Intervene when inappropriate behavior occurs.
- If necessary and effective, pair female students together initially to develop confidence and skills.
- Actively point out and dissuade activities, comments, and jokes that reflect stereotyping, bias, or harassment.

3 CURRICULUM & INSTRUCTION

It is an important basic step that the technology education community strives to use gender-neutral language, employs gender-balanced media, introduces students to female role models, and enriches the curriculum. These steps alone are not sufficient. Removing gender bias from the technology education curriculum will require systematic change. It is not enough to discuss famous women. The goal is to have students understand that women *and* men are intrinsic and integral parts of the enterprise called technology, and that both men and women will lead lives requiring sophisticated technical skills.

Research indicates that boys and men perceive technology differently than girls and women. Girls and women see it as a means of facilitating collaboration, communication, and linkages between people. Boys and men tend to see technology as a means of extending their control over their physical environment. Males tend to identify strongly with the technical details

whether girls and young women will participate in technology education: social fit, classroom climate, curriculum and instruction, role models and mentors, and messages from counselors. Below is a discussion of each factor, along with strategies to consider

associated with a given technology, while females are more attentive to its practical applications. Technology education teachers should use instructional methods that consider multiple perceptions and perspectives so *all* students are engaged in learning.

Strategies to consider

- Connect curriculum to the real world of diverse students.
- Choose metaphors carefully and let students add their own.
- Provide students with extra "credit" for identifying times when an unfamiliar term, procedure, or activity was used but not defined or explained.
- Portray technology as a way to solve problems as well as a plaything.
- Give frequent and supportive feedback.
- Encourage girls to develop confidence and "act as experts."
- Connect subject matter and procedures across curriculums and team teach.
- Feature technologists of the week, and ensure that men and women of all ethnicities are equally represented.

4 ROLE MODELS & MENTORS

Research tells us that role models and mentors, especially family members, are powerful influences on females who pursue careers in technology. Girls and young women still see mostly men in scientific careers and as teachers of classes related to mathematics, science, and technology. Although these male teachers work hard to be inclusive, there still is the perception that the absence of women means that women are not as welcome to pursue technology and that the study of technology is a male endeavor. Because of the lack of female role models, girls and young women are reluctant to consider the study of technology and the pursuit of nontraditional occupations among their life options. Male teachers need to model support, acceptance, and confidence in young women in technology education. Many women engaged in technology-based careers cite a male mentor as critical to their entry into their field.

Girls and young women need to be exposed to women who have successful careers in technical fields. However, some experts recommend avoiding placing too much emphasis on the "heroines of technology." Some role models can be counterproductive if they suggest girls and young women have to make significant sacrifices, especially family sacrifices, to become accomplished technologists. Instead of relying on people who might be perceived as "super women," research recommends using everyday women from the community who have careers in technology and lead ordinary lives. Many female students in technical or other colleges are strong role models because of their relative youth and connection to middle and high schoolers.

Additionally, role models and mentors should reflect diverse cultures to reinforce the point that technology-related occupations are open to everyone and can be very satisfying. Because culture plays such an important role in the development of a child's self-identity, it is critical for girls and young women to see women from their own cultures being successful in technology.

Strategies to consider

- At the end of projects, have celebrations to which students invite friends.
- Prominently display projects.
- Have young men and women recruit other young women.
- Provide poster sessions in the gym where students share what they've done in technology education.
- Create a mentor program for high school girls with women in the community who are engaged in technological pursuits.
- Connect middle school girls with high school girls in technology education to work on a specific project.
- Develop a pen pal program/Internet connection with other girls and young women interested in technology.
- Encourage students to job shadow women and men in the community who use technology in their jobs.

5 MESSAGES FROM COUNSELORS

Guidance counselors provide students with information and advice about careers that will complement their skills and interests and recommend classes to take in preparation for those careers. Research tells us that in both areas —career counseling and course selection—not all guidance counselors are communicating effectively with girls about considering technology education and related careers.

Middle school students are unaware of the educational requirements and salary potential of most trade and technical careers. Girls still choose jobs and careers based on gender stereotypes. Counselors need to communicate to girls that jobs in or using technology are legitimate and satisfying options. One way to do this is to gather and share information on nontraditional occupations in new and creative ways.

For girls in technology education, career counseling needs to be specific and concentrated on presenting information about nontraditional occupations that relate to the work they do in technology education class. Research indicates that girls in middle school do not make connections between what they are learning in technology education classrooms and careers in technology fields.

With regard to course selection, girls are consistently choosing traditional elective classes. Middle school girls are uninformed about the various technology education classes available to them at the high school and postsecondary levels.

Some parents, community members, educators, and guidance counselors perceive that technology education is not appropriate for students planning to attend a four-year college or university. This perception does not reflect the reality that technology education is MORE than skills preparation. In our changing workplaces, the increased demand for technologically literate workers means that *all* students would be well prepared for work as a result of taking technology education courses.

Strategies to consider

- Provide more information to both students and parents about the salaries, necessary preparation, and opportunities in nontraditional occupations.
- Provide opportunities for young women to visit nontraditional job sites and meet with workers, including job shadowing or internships in nontraditional occupations.
- Hold technology-focused meetings, activities, or lunch sessions in middle school career centers.
- Facilitate the development of interdisciplinary courses between technology education and other academic departments.
- Create more flexibility in course selection so students have increased opportunities to take technology education classes.
- Develop counselor externships with technology-based businesses and industries.
- Work with technology education teachers to appropriately market technology-related careers.
- Highlight accomplishments of technology education students.

The information in this piece is based on *Modeling Athena: Preparing Young Women for Work and Citizenship in a Technological Society*. Professor Ken Welty and Brenda Puck (University of Wisconsin–Stout) wrote *Modeling Athena* as part of the TACKLE Box Project. For a copy of *Modeling Athena*, access the TACKLE Box webpage by visiting http://www.dpi.state.wi.us/dpi/dlsea/equity/sxequintro.html.

tackle box project

Under the Carl D. Perkins Vocational and Technical Act of 1998 (Perkins III), all funded local educational agencies (LEAs) have the responsibility to serve all special populations. Special populations include students preparing for nontraditional training and employment, single parent and pregnant teens, economically disadvantaged students, academically disadvantaged students, individuals with disabilities, students with limited English proficiency, students of color, and individuals with other barriers to educational achievement.

To support LEAs as they create opportunities for special populations and infuse educational equity into their programs and services, the Department of Public Instruction, UW-Stout, and educators around the state are collaborating on a four-year statewide initiative entitled the TACKLE Box Project (Technology Action Coalition to Kindle Lifelong Equity).

The mission of the project is to ensure that careers in technology are recognized as viable career options by all students in Wisconsin through training and information to administrators, educators, counselors, parents, and communities.

The primary goal of the TACKLE Box Project is to increase the number of girls and young women in technology education classes.

The TACKLE Box Project will work toward this goal by:

- ensuring that all Wisconsin technology education teachers, counselors, and administrators are aware of the need to increase the number of girls in technology education (conference presentations, mailings, word of mouth);
- identifying the factors that influence the decisions of girls and young women to participate in technology education (*Modeling Athena: Preparing Young Women for Work and Citizenship in a Technological Society*);
- developing a set of web-based materials and resources to be used by administrators, educators, counselors, parents, and communities that address the factors influencing girls' participation in technology education (http://www.dpi.state.wi.us/dpi/dlsea/equity/sxeqintro.html);
- providing in-depth training to LEA staff on the factors that influence girls' and young women's participation in technology education and on strategies and actions to increase girls' and young women's participation in technology education (summer academies, pre-conference workshops, regional trainings);
- providing support to educators who are implementing strategies and actions in their classrooms to increase the number of girls in technology education (e-mail discussion list, *TACKLE Box Institute*);

A secondary goal of the *TACKLE Box Project* is to create a model for LEAs to meet the needs of students in nontraditional occupations and other special populations in career and technical education. The process of the project (identification of contributing factors, increasing the visibility of the issues, development of materials and resources, training, and ongoing support) can be replicated for any special population in any career and technical education program area. Additionally, many of the factors — and the suggested strategies — are important considerations for infusing educational equity into any program.

For more information on the *TACKLE Box Project:*
visit the project website at http://www.dpi.state.wi.us/dpi/dlsea/equity/sxeqintro.html.

You also may contact:

Courtney Reed Jenkins, gender equity consultant
Equity Mission Team, Department of Public Instruction
(608) 267-2443 (courtney.jenkins@dpi.state.wi.us)

Ken Starkman, technology education consultant
Lifework Education Team, Department of Public Instruction
(608) 266-2683 (kenneth.starkman@dpi.state.wi.us)

Katherine Weber, technology education teacher
Waukesha School District
(262) 970-3387 (kweber@waukesha.k12.wi.us)

Ken Welty, professor
College of Technology, Engineering, and Management, UW-Stout
(715) 232-1206 (weltyk@uwstout.edu)

resources

Wisconsin Programs

Department of Public Instruction Equity Mission Team
The Equity Mission Team promotes and protects the rights of all children to obtain a quality education in Wisconsin schools and advances and supports effective and inclusive education practices and curriculum that lead to high achievement of all students.
http://www.dpi.state.wi.us/dpi/dlsea/equity/index.html

Department of Public Instruction Lifework Education Team
The Lifework Education Team provides leadership, service, and connections to prepare learners for life, work, and careers.
http://www.dpi.state.wi.us/dpi/dlsis/let/index.html

Medicine, Engineering, Dentistry, Agriculture, and Law (MEDAL)
UW-Milwaukee introduces high school students from under-represented minority groups to five major professions.
Contact: Marion McDowell at marionm@uwm.edu or (414) 229-5761

National Institute for Science Education
A project of the Wisconsin Center for Education Research at the University of Wisconsin-Madison and funded by the National Science Foundation.
http://www.wcer.wisc.edu/nise/

Summer Engineering and Technology Camp
UW-Stout hosts annually a tuiton-free summer engineering and technology camp for girls entering 7th grade.
http://www.uwstout.edu/ctem/steps/

Women and Science Program
A listing of programs, contacts, and links to science and technology opportunities that are available for girls through the UW-System.
http://www.uwosh.edu/wis/girls.htm

Other Programs

4000 Years of Women in Science Biography Listing
http://crux.astr.ua.edu/4000ws/summary.shtml

About Voices of Girls in Science, Math and Technology
http://www.ael.org/nsf/voices/vocbrief.htm

Eisenhower National Clearinghouse
http://equity.enc.org/

EQUALS: Family Math Program
http://equals.lhs.berkeley.edu/

GenTech
http://www.shecan.com

Girls Incorporated – Operation SMART
http://www.girlsinc.org

Girlstart Smart from the start!
http://www.girlstart.org/

Her Own Words Video series: *Women in Nontraditional Careers*
http://www.herownwords.com

Institute for Women in Trades, Technology and Science
http://www.iwitts.com

Math/Science Network
http://www.expandingyourhorizons.org/

National Council for Research on Women
http://www.ncrw.org

National Science Foundation: Program for Gender Equity in Science, Mathematics, Engineering, and Technology (PGE)
http://www.ehr.nsf.gov/

Women-Related Websites in Science and Technology
http://research.umbc.edu/~korenman/wmst/links_sci.html

Curriculum & Instruction

Design and Technology Engineering Activities
http://mars2000.enoreo.on.ca/

Discover Engineering Online
http://www.discoverengineering.org/eweek/main.htm

Elementary Curriculum
http://www.cs.bsu.edu/homepages/kirkwood/briefs.htm

Elementary Design and Technology
http://www.teachingideas.co.uk/

Kathy Schrock's Guide for Educators
http://school.discovery.com/schrockguide/sci-tech/scigs.html

Newton's Apple: Teacher Guides
http://www.pbs.org/ktca/newtons/alpha.html

The Time Plan Virtual Teacher Center
http://www.timeplan.com/vtc/index.htm

Parents, Mentors & Counselors

Coordinator's Manual: Career Mentoring for Middle and Junior High School Girls
http://www.flstw.fsu.edu/menindx.html

"Expect the best from a girl and that's what you'll get"
http://www.academic.org/

GirlTech
http://www.girltech.com/Mentors/MN_menu_frame.html

Books & Articles

Girls and Technology
This website contains a bibliography of a large number of books about girls and technology.
http://www.ncgs.org/Pages/scitek.htm

International Technology Education Association ITEA-CATTS Consortium
Standards-based Guide for Teaching Middle Level Technology Education. (May be purchased through ITEA: http://www.iteawww.org/)

Silverman, Suzanne and Alice M. Pritchard
"Building Their Future: Girls and Technology Education in Connecticut." *Journal of Technology Education* (Volume 7, Number 2, Spring 1996).
http://scholar.lib.vt.edu/ejournals/JTE/jte-v7n2/silverman.jte-v7n2.html

TACKLE Box Project
"Modeling Athena: Preparing Young Women for Work and Citizenship in a Technological Society" (Summer, 2000).
http://www.dpi.state.wi.us/dpi/dlsea/equity/sxeqintro.html

Student Associations & Competitions

Technology Student Association
http://www.tsawww.org/

Wisconsin SkillsUSA
http://www.thelocalschools.com/WI/SkillsUSA-VICA/

National & State Technology Organizations

Association for Career and Technical Education
http://www.avaonline.org

International Technology Education Association (ITEA)
http://www.iteawww.org/

Washington State Technology Education Association
http://www.camas.wednet.edu/chs/netlinks/tech/index.html

Wisconsin Technology Education Association
http://www.wtea-wis.org

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